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AUTHORS

Electronic Banking and Financial Performance of Selected Category II Microfinance Institutions in Douala

Achamoh Victalice Ngimanang[1] & Takoutio Virginie Feudjio[2]

[1]Department of Economic Science, HTTTC of the University of Bamenda, Bambili, Cameroon

[2]Department of Banking and finance, FEMS of The University of Bamenda, Bambili, Cameroon

Correspondence: Achamoh Victalice Ngimanang, Department of Economic Science, HTTTC of the University of Bamenda, Bambili, Cameroon. email: ngimanang2@gmail.com

Abstract
The role of electronic banking on the performance of financial institutions has continued to empirical research. It is in this perspective that, this study investigates the effects of the adoption of ebanking services on the financial performance of some selected category II microfinance institutions in DoualaCameroon. To attain the stated objective, related concepts and theories were reviewed. The expost facto research design was adopted using secondary annual data collected from nine Category II MFIs operating in Douala for the period of 14 years (2010 to 2023). Descriptive and panel data regression analyses were performed to analyze the data using Stata version 14. For the specification tests, the results of Hausman selection test with p-value of 0.768, and that of Breusch Pagan Lagrangian Multiplier test with p-value of 0.000, indicate that the random effect model is more appropriate for studies against fixed effect and common effect models. The results of the random effect multiple regression analysis revealed that the contributions of mobile banking, ATM banking and online (internet) banking to the profitability of category II MFIs are all positive and statistically significant except the variable for online banking that was not significant. The policy implications of these results were that stakeholders of Category II MFIs could uphold financial performance by effectively and efficiently adopting ebanking services most especially the mobile banking and ATM banking.

1.   Introduction

In the last two decades, a good number of category II MFIs in Cameroon are increasingly adopting varied services of ebanking. Steven, (2002) defines Electronic Banking as the use of electronic and telecommunication networks to deliver a wide range of value-added products and services to bank customers including the delivering of banking services using palm pilots, ATM, debit cards, point of sale (POS) devices and cell phones. In which case, customers perform banking transactions electronically without visiting a brick-and-mortar institution and its logistical systems (Epstein 2004). As Dabholkar, Bobbitt, and Lee (2003) indicated, the recent advances in technology have created a surge in technology-based self-service. Both financial institutions and customers are seeking for products that are convenient in terms of accessibility and cost and e-banking offers some of these benefits. Various forms of electronic banking which are used interchangeably in some literature could be sorted including PC banking, online banking, internet, mobile banking, ATM banking (Epstein 2004; Ahmed, 2018).

There is a radical increase in the use of electronic banking being practiced in category II microfinance. Cameroon has the potential to revolutionize access to financial services and there is a growing consensus that e-banking offers a unique opportunity to address mainstream bank's two major barriers to serving the lowincome market; the need for a branch infrastructure and managing high volumes of low value transactions. However, this new venture is costly to launch and manage. Evaluating whether the increase in costs and the possibility of eventually having less personnel impact the performance of financial institutions adopting the ebanking services positively is a call for concern. Most studies on the effects of ebanking on performance concentrated on the banking sector with mixed results (Ledgerwood, 1999; Kegan et al. 2005; Ombati et al. 2010; Muiruri, & Ngari, 2014; Mabwai, 2016; Mutua, 2017; Jamgun and Miroga, 2018, Ahmed, 2018, Ulaya et al. 2023 & Nkiendem et al, 2023). Less attention has been paid to MFIs in this regard. Few related studies conducted on Microfinance merely highlight the problems faced by the institutions in embracing the modern technology of adopting some services of electronic banking, but ignore the empirical evidence on how such services affect the performance of MFIs (Mwangi, 2009; Sumra et al. 2009; Shittu, 2010; Okiro and Ndungu, 2013; Mattila, 2016).

In recent years, many category II microfinance institutions have been established and they offer services similar to those of commercial banks to the marginalized customers. In this light, many of these category II MFIs have adopted some form of e-banking whose success on financial performance of the institutions is worth investigating. This article addresses this situation by examining the effects of mobile banking, ATM banking, online (internet) banking as constructs of Ebanking services on the performance of selected MFIs in Douala.

2.   Literature Review

This section reviews three related theories including the theory of innovation Diffusion, Constraint-Induced Financial Innovation and Technology Adoption Model, followed by four

crucial empirical literature sources to better understand the part play by ebanking services in a financial institution.

2.1 Theoretical literature Review

Rogers (1983) developed the Innovation Diffusion Theory which describes the patterns of adoption and mechanism, and predicts how a new invention could be successful. According to the theory, technological innovation passes through five stages: knowledge (exposure to its existence, and understanding of its functions); persuasion (the forming of a favourable attitude to it); decision (commitment to its adoption); implementation (putting it to use); and confirmation (reinforcement based on positive outcomes from it). The theory further identifies different adopter categories as: innovators (venturesome); early adopters (respectable); early majority (deliberate); late majority (skeptical); laggards (traditional). It is evident from this theory that the adoption of innovation generally depends on the relative advantage (the degree to which it is perceived to be better than what it supersedes), compatibility (consistency with existing values, past experiences and needs); complexity (difficulty of understanding and use), trialability (the degree to which it can be experimented with on a limited basis) and observability (the visibility of its results).

Constraint-Induced Financial Innovation Theory proposed by Silber (1983) states that the inspiration behind advantage boost of fiscal organizations is the key motive of financial progression. There are a few limitations throughout the time spent looking for after benefit expansion. Despite the fact that these confinements not just ensure the security of administration, they diminish the productivity of financial organization, so financial organizations endeavor toward throwing them off. The theory supports the argument that financial innovations are as a result of constraints facing Microfinance institutions. It discusses fiscal improvement from microeconomics, so it is instigated and illustrative. However, it emphasizes ―innovation in hardship‖ disproportionately. Constraint-induced innovation hypothesis perceives digital strategy from microeconomics, so it is representative. It however stresses development in difficulty circumstances and neglects to acknowledge the role of increased advancement in liberal finance.

Technology Adoption Model (Davis, 1989) and its extension has been widely recognized and used in the adoption and implementation of Information Technology (IT) in the Information Systems (IS) discipline. According to this model, perceived usefulness and perceived ease of use are the two main factors determining an individual's intention to accept and use of an IS (Davis, 1989). Perceived usefulness is defined by Davis as the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989). Perceived ease of use is defined as the degree to which a person believes that using a particular system would be free from effort (Davis, 1989). These two factors have been empirically justified as important factors determining the adoption and use of an IS, including the adoption of online banking (Vijayasarathy, 2004).

2.2 Empirical Review

Kegan et al. (2005) examined the impact of online banking applications on community banks performance in America in which a structural equation model was used to create an

online banking index and an econometric model was developed to evaluate bank performance. A survey of ten community institution was conducted. Once the pilot study was considered acceptable, all community institution with total assets less than One billion United States Dollars operating in Iowa, Minnesota, Montana, North Dakota and South Dakota were identified and using the structural equation model to evaluate the various variables identified and used to examine whether the index explains differences in community bank performance. The results indicated that banks that provide extensive online banking services tend to perform better than those who lag behind. In addition, online banking helps community banks improve their earnings ability as measured by return on equity and improve asset quality. Since the study was conducted in a highly technologically advanced economy, this study sought to find out how the counterparts in less developing countries like Cameroon do perform such.

Sumra et al. (2009) examined the impact of e-banking on profitability of Pakistani banks. The study was carried out by assessing the qualitative factors determining the impact of e-banking. It was descriptive and exploratory in nature and was carried out by interviewing managers of some banks in Pakistan on electronic services being provided. The study showed that e-banking has increased the profitability of banks; it has enabled banks meet their costs and earn profits even in the short span of time. Ombati et al. (2010), examined the relationship between technology and service quality in the banking industry in Cameroon. The research was carried through a cross- sectional survey design which questioned respondents on e-banking services. The population of the study mainly constituted customers of banks within the central business district of Douala with a sample size of about 120 and above. Data was analyzed by use of frequency, percentage, means and correlation analysis. The findings revealed that there is a direct relationship between technology and service quality which can translate to performance of the bank. The different dimensions of offering banking services electronically such as security, efficiency, accurate records, convenience and accurate transactions are critical in the adoption of internet banking hence need to measure the effect of adoption of e-banking on the financial performance.

Muiruri and Ngari (2014) conducted a study on the impact of financial innovations on the Performance of commercial banks in Kenya and found that there was a significant negative correlation between technology use and the overall operational costs of a company. According to the study as the banks adopted the use of technology in service delivery, the overall costs incurred in delivering these services reduced. Jamgun and Miroga (2018) investigated the effect of Mobile Banking on Financial Performance of Small Scale and Medium Enterprises in Kakamega County using primary data collected from sample of 373 SMEs entrepreneurs. Regression analysis was used and the findings revealed that SMEs used mobile banking services to send and receive money, check account balance, knowing when deposit or withdrawal has been conducted from their bank account. Again, that relationship between cost of mobile banking services and financial performance of SMEs was negative with correlation coefficient of -0.660.

Ulaya et al (2023) investigated the effects of ATM technology on the performance of banks in Tanzania using a sample of 125 bank employees in Dar es Salaam City using the

chi-square technique and SPSS softwares. The findings revealed that the implementation of ATM terminals has generally been beneficial for banks in Tanzania, it has also been associated with higher fraud rates. The quality of service provided by ATM machines is not related to the privacy and security of its users or providers. The authors noticed that, banks have to enhance their security measures to prevent web scammers from infiltrating their customers' accounts and also have to provide customers with electronic warnings when their transactions are being processed through the machines.

In the MFIs market, Bogan et al. (2007), used data from more than three hundred MFIs which reported their financial data to the Microfinance Information Exchange (MIX) market, to examine whether capital structure, affect the financial sustainability of MFIs based on the life cycle stages. The results from the study reveal that various issues other than life cycle seem to be related with sustainability. Notably, it found that a MFI's capital structure is linked with financial sustainability of MFIs. In addition, Bogan (2009), using panel data establishes a connection between capital organization and key measures of MFI success. The study reveals fundamental proof ancillary the allegation that an augmented use of grants by large MFIs reduces working self-sufficiency. Kinde (2012), after a quantitative methodology utilizing a decent board informational collection of 126 perceptions from 14 MFIs working in Ethiopia between 2002 and 2010, uncovers that microfinance broadness of effort, profundity of effort, reliance ration and cost per debtor influence the monetary sustainability of microfinance institutes in Ethiopia. Be that as it may, the microfinance capital organization and staff efficiency have immaterial effect on fiscal sustainability of MFIs in Ethiopia for the examination time frames. It is noticed that none of the few studies on MFIs focus on the relationship between ebanking services and performance of the institutions.

3   Methodology

This section focuses on the study area, the nature of data used, method used in collecting and analyzing data, the research design adopted in the study, and the presentation and discussion of the results of the findings in line with the three research hypotheses formulated for the attainment of the research objectives.

3.1 Scope, research design and data

This study was conducted in Douala, the economic capital and also the largest city of Cameroon with an estimated population of about 3,793,000 inhabitants in 2021. Importantly, Douala hosts a good number of licensed microfinance present in Cameroon. This paper adopts an ex-post facto design since it is quasi-experimental study examining how an independent variable, present prior to the study, affects a dependent variable. Use was made of secondary annual panel data for the main variable of interest spanning from 2010-2023 collected from the archives of nine purposely selected category II Microfinance Institutions in Douala.

3.2 Specification of panel data regression Model

The panel data model is estimated using either fixed or random effect techniques after the test of homogeneity. These two techniques have been developed to handle systematic tendency of individual specific components to be higher for some units than for others – the fixed effects estimator is used if the individual specific component is not independent with

respect to the explanatory variables while the random effect estimator is used if the individual specific component is assumed to be random with respect to the explanatory variables (Dewan and Hussein, 2001).

　　　FinP=f(Ebanking)

　　　FinP=f(MOB, ATMB, ONLB) …………………………………………….. 1)

　　　　　　Taking care of error term and the constant term, the above functional relationship, the more specific econometric model of financial performance of MFIs in view of testing the research hypotheses of the study using the panel data collected is specified as:

$$FinP_{it} = \lambda_0 + \lambda_1 MOB_{it} + \lambda_2 A\dot{T}MB_{it} + \lambda_3 ONLB_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots .. (2)$$

Where:

$FinP_{it}$	=	Financial performance measured in terms of profitability (ROE)
MOB_{it}	=	Mobile banking
$ATMB_{it}$	=	Automated Teller Machine banking
$ONLB_{it}$	=	Mobile banking
I	=	Subscript i denotes the number of category II Microfinance Institutions (1 to 9)
T	=	Subscript **t** refers to time period in years (2010 to 2022)
λ_0	=	The constant term
$\lambda_1, \lambda_2, \lambda_3$	=	Parameters to be estimated for the verification of hypotheses (H_1, H_2 and H_3).
E	=	The error term

The variables are described and Measured as follows:

　　　　Financial performance (FinP) is the measurement of the outcome of institution's polices and operations in monetary terms. It is an assessment of the firm's overall financial health over a given period of time (Noveu, 1981). These are reflected in the firms return on investment, return on assets and value added. That is, the degree to which the financial objectives are accomplished. Some fnancial performance indicators include Revenue, Expenses, Operating Profit, Assets Under Management (AUM), Return On Equity, Return On Assets (ROA). In this study, financial performance of category two MFIs is measured using ROE, the only indicator of which data could be gotten for the nine MFIs understudy for the stated period.

　　　　Mobile banking (MOB) also known as M-Banking is a term used for performing balance checks, account transactions, payments, credit applications and other banking transactions through a mobile device such as a mobile phone or Personal Digital Assistant (PDA). Mobile phone banking is the most popular option of e-banking as there has been a phenomenal expansion of the use of mobile phones and there lies a huge opportunity to operate virtual bank accounts either through the use of menu driven systems (such as M-Pesa, Airtel money) or through SMS technology which is already used by millions of people (Ritho & Jagongo, 2015). This option has a very significant advantage because it has already been accepted and that the distribution infrastructure in form of the millions of mobile phones is

already in existence (Muriuki, 2009). The introduction of M-banking taken as a dummy variable in this article is expected to have a positive effect on profitability of MFIs.

ATM Banking (ATMB) refers to data terminals for convenient money transactions. They are actually kiosk computers with a keypad and screen (Flitch, 2000). The patron is prompted with instructions and given a choice of transactions. An optional receipt can be printed for the patron's records. Bank access to accounts is provided through telephone networking, a host processor, and a bank computer to verify data. According to Ulaya et al. (2023), the combined services of an ATM and a human teller can result in higher productivity for banks during business hours. It also saves customers time by allowing them to perform their transactions in a more efficient manner. The use of ATM has cut service staff in traditional banks. It eliminated the need to enter a bank for basic transactions and allowed access to accounts on machines located at strategic places. Financial institutions charge fees to use their ATM, making the transactions very profitable for the host banks. The introduction of ATM banking captured as a dummy variable in the ongoing study is therefore hypothesized to impact profit of MFIs positively.

Online Banking (ONLB) is referred to as internet banking, web banking, and virtual banking (Driga & Isac, 2014). Online banking constitutes one of the key concepts which encompasses the fundamental idea of e-banking in the modern society. The system enables customers of financial institutions to access accounts and general information on bank products and services or perform account transactions directly with the bank through a personal computer using the internet as the delivery channel; customers are able to access all of their accounts through the website of the bank and are allowed to conduct banking activities such as transferring funds, paying bills, viewing account balances, paying mortgages or purchasing financial instruments and certificates of deposits. Online banking is not a common place in MFIs as is the case with most banks in Cameroon. The introduction of online banking is captured as a dummy variable and it is presumed to have a positive effect on financial performance of category 2 MFIs in Douala.

3.3 Selection of Appropriate Regression Estimation Technique

The choice of regression estimation of panel data depends on the results of Hausman test. Chow test is a pretest which is used to verify homogeneity of all sections of the data in a panel and it helps to determine whether data are actually panel or not (pooled). When Chow statistics is significant ($pv < 0.05$), Fixed Effect is more appropriately than Common Effect. In the same analogous, Hausman test is a statistical test favours Fixed Effect against Random effect when it is significant. Lagrange multiplier test (LM) is a post Hausman test which maintains Random effect against Common Effect when it is statistically significant. To ascertain the appropriate regression technique to be used in the selected model, use was made of two Pre-estimation tests: multicollinearity using pairwise correlation matrix, and im, Pesaran and Shin- IPS unit root test. After specifying the models and selecting the appropriate one, three post estimation tests (normalities, heteroscedasticity and autocorrelation) are necessary to ensure that the panel regression models are in correct functional form.

4   Results and Discussion

This section is reserved for the presentation of descriptive statistics, correlation analysis, stationarity analysis and the result of panel regression including results of selection tests. It moves forward to discusses the results of the appropriate model in relation to the three hypotheses of the study.

4.1 Presentation of the Results

The results of the findings are presented in the form of tables.

4.1.1   Descriptive Statistics

A summary of the descriptive characteristics of the variables such as the mean, variance, minimum, maximum values, the skewness and kurtosis values are presented in the table below.

Table 1: Descriptive Statistics of the panel data for the variables

Variables		Mean	Std. Dev.	Min	Max	Observation	
Mobile	Overall	0.452381	0.499714	0	1	N=	126
banking	Between		0.205163	0.2142857	0.8571429	n=	9
	Within		0.4604346	-0.4047619	1.238095	T=	14
ATM banking	Overall	0.190476	0.394244	0	1	N=	126
	Between		0.225877	0	0.7142857	n=	9
	Within		0.3312315	-0.5238095	1.119048	T=	14
Online	Overall	0.698412	0.460779	0	1	N=	126
banking	Between		0.6486338	0.1428571	1	n=	9
	Within		0.5259531	-0.2301587	1.555556	T=	14
Profitability Overall 1.928175 0.806408 0.87 3.75 N= 125 (ROE) Between 0.6486338 1.090714 2.967692 n= 9							
	Within		0.5259531	0.7139715	3.243971	T=	13.89

Source: Computed by the author using data from archives of Category II MFIs IN Douala, 2023.

Table 1 presents a summary of descriptive statistics of the variables used in the model. The descriptive statistics are used in order to get insight about the relationship between electronic banking and financial performance variables of sampled category II Micro Finance Institutions. From the result, all the indicators of electronic banking (mobile banking, ATM banking, and Online banking) have a minimum value of 0 and a maximum value of 1 since all these constructs were captured as dummy variables. The mean value of the variable for mobile banking in the selected MFIs of 0.452381 implies a moderate level adopting this aspect ebanking but however, there exist very little disparities among category II MFIs as indicated by an overall standard deviation of 0.4997. the between and within standard deviation of 0.205163 and 0.4604346 respectively confirmed low variability over time and across category II Microfinance institution of Douala.

The situation with the adoption of ATM banking is worse with the mean value of barely 0.190476 and overall standard deviation of 0.225877 indicating low disparity of the

service over time and across MFIs as between and with deviation are 0.394244 and 0.225877. The situation with online banking seems better with a mean value of 0.698412 which is above the midpoint of 0.5 but standard deviation greater than 0.5 between and with MFIs with an overall value of 0.460779 indicating moderate discrepancy overtime and across the institution. Variable for profit which is the dependent variable captured using ROE has a minimum of 0.87 and a maximum value of 3.75. On the average, ROE of category two MFIs stood at 1.928175 in the area with overall standard deviation exceeding 0.7 is is a profit that return on equity varies over time and across MFI in Douala. However, a plausible relationship between these variables can be envisaged by using correlation and regression analysis.

4.1.2   Correlation Analysis

The pair-wise correlation was used to establish the relationship between the variables used in the model and it also used as a pre-test for multi-collinearity. The correlation coefficient expresses the degree of relationship existing between variables. The values of the correlation coefficient will always range from -1 to +1. The sign in the correlation matrix indicates the direction and the degree of the relationship.

Table 2: Correlation Matrix

Variables	Mobile banking	ATM banking	Online banking	Profitability (ROE)
Mobile banking	1.0000			
ATM banking	0.4518	1		
Online banking	0.3324	0.2877	1	
Profitability (ROE)	0.5640	0.3606	0.0572	1

Source: Author computation, 2022

This study carried out a pair-wise correlation analysis. From the result, mobile banking, ATM banking, and online banking are positively correlated with financial performance of category 2 MFIs measured in terms of ROE. Financial performances of category II microfinance on mobile banking were found to be positively correlated as shown by correlation coefficient of 0.4518. The study also established that the financial performances of category II microfinance on ATM banking were found to be positively correlated as shown by correlation coefficient of 0.3324 and conclusively. The study also established that the financial performances of category II microfinance on online banking were found also to be strongly and positively correlated as shown by correlation coefficient of 0.5640.

4.1.3   Stationarity test

To ensure that or result reflects the classical principle and converges towards the reality, we did the stationarity test for all our variables off interest. We test for stationarity using Im-Pesaran Shin unit root test. They test was used so as not to commit any fallacy in conclusion for stationarity. For the variables to be stationary, the absolute p-value should be

inferior to the significant level taking into consideration that the considered significant levels are one percent, five percent and ten percent.

Table 3: Im-Pesaran-Shin unit root tests results of variables

Variables	Statistic (t-bar)	p-value	1% critical value	5% critical value	10% critical value	Decision
Mobile banking	-2.6235	0.0000	-2.240	-2.020	-1.901	I(0)
ATM banking	-2.2304	0.0370	-2.240	-2.020	-1.901	I(0)
Online banking	-2.0894	0.0577	-2.240	-2.020	-1.901	I(0)
Profitability	-1.9848	0.0000	-2.240	-2.020	-1.901	I(0)

Source: Author computation, 2023

From the results presented on table 3, all the variables are stationary at levels. The null hypothesis in Ips unit root test states that all the series included have unit root or are non-stationary. If the null hypothesis is rejected, the series is stationary at least for one panel member. This indicates that all the variables are stationary at levels.

4.2 Results of Fixed, Random and Common effects modeling (Hypotheses Testing)

The three hypotheses of the study are verified using Hausman selection test to make a choice of the appropriate model for interpretation between fixed effect model and random effect modelling technique for the performance of MFIs. The results reported on table 4 revealed that the random effect model is more appropriate for this study, since the probability of Hausman test exceeded 0.05 indicating that Ho: Fixed effect model is rejected in favour of H_1: random effect model. This was further supported by the post-Hausman test result conducted using Breusch Pagan Lagrangian Multiplier test whose result displayed a probability value of less than 0.05 indicating that random effect model (H_1) is more appropriate for the data than common effect model (H_0).

The coefficient of mobile banking captured in the ongoing study as a dummy was the most significant in determining financial performance of category 2 MFIs in Douala and the variable displayed the expected signs in the regression. The variable was positive as hypothesized and has a very high significant force in contributing to the profitability of the MFIs. The regression results show that the effect of mobile banking with the coefficient of 0.676 has a p-value of 0.000 ($pv < 0.1$). This result implies that a unit improvement on mobile banking services of category 2 MFIs is capable of improving the institution's profit by over 0.67.

Table 4: Results of the Fixed, Random, Common effect models and selection tests

VARIABLES	(FE) FinP	(RE) FinP	(CE) FinP
Mobile banking	0.6761628***	0.6962393***	.6761628***

	(0.0803808)	(0.079155)	(0.0803808)
ATM banking	0.4366427***	0.4339478***	.4366427***
	(0.1014866)	(0.1002267)	(0.1014866)
Online banking	0.1353519	0.0885753	0.1353519
	(0.0969727)	(0.0962408)	(0.0969727)
Constant	1.441824***	1.457948***	1.441824***
	(0.1767766)	(0.0677594)	(0.1767766)
Observations	126	126	125
R-squared	0.618	0.629	0.628
F(8, 113)	63.89	183.08	183.08
Number of MFIs	9	9	9
HausmanChi(2)		1.06	p-value= 0.7875 p-
Breusch Pagan LM Chibar2(01)		215.33	value= 0.000***

Note: Standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: Author computation

The regression results equally reveal that the variable for ATM banking was the second most important in influencing financial performance of MFIs in Douala and the variable was positive as hypothesized and highly significant too in contributing to the financial performance of MFIs in the studied area. The regression results depict that the effect of ATM banking with the coefficient of 0.436 has a p-value of 0.000 (pv < 0.01) indicating that ATM banking is significant at five percent level in promoting the financial performance of cat II MFIs firm in Douala. This result implies that a unit improvement on ATM banking of MFIs is capable of improving the MF institution's profit by over 0.43.

The coefficient of online banking captured in the present study as a dummy has a positive but not very significant in determining financial performance of category 2 MFIs in Douala and the variable displayed the expected signs in the regression. The variable was positive as hypothesized and was not significant in influencing the profitability e of the MFSs. The regression results show that the effect of online banking with the coefficient of 0.135 has a p-value of 0.163 (pv > 0.01) indicating that the variable is significant at one percent level in contributing to the financial performance of category 2 MFIs in the area. This indicates that the variable is not significant even at ten percent level in contributing to the financial performance of MFIs in the area.

4.3 Discussion of the results

The first research hypothesis on the effect of mobile banking on the financial performance of MFIs is achieved as mobile banking was highly significant in determining financial performance of category 2 MFIs in Douala and the variable displayed the expected signs in the regression. This indicates that the variable is not significant even at ten percent level in contributing to the financial performance of MFIs in the area. Similar results were obtained by Ritho & Jagongo (2015), Mabwai (2016), Mattila (2016) and Mutua (2017) on their studies on the effect of mobile banking on performance of banks.

The second research hypothesis on the effect of ATM banking on the financial performance of MFIs is achieved as ATM banking was highly significant in contributing to financial performance of category 2 MFIs in Douala The regression results reveal that ATM banking has a positive effect on the financial performance. The result of this study indicates that ATM banking is significant at five percent level in promoting the financial performance of cat II MFIs firm in the Douala. This result implies that a unit improvement on ATM banking of MFIs is capable of improving the MF institution's profit by over 0.43. The result is in congruent with that of Ulaya *et al.* (2023) on the role of ATM banking on the performance of 48 Tanzanian banks.

The third research hypothesis on the effect of online banking on the financial performance of MFIs is also attained but not very satisfactory. Online banking was not significant in determining financial performance of category 2 MFIs in Douala but has a positive force in enhancing financial performance of category 2 MFIs in Douala and the variable displayed the expected signs in the regression. This result implies that a unit improvement on online banking services of MFIs is capable of improving the institution's profit by over 0.67. This result is in line with that of Vijayasarathy (2004), Kegan et al. (2005) and Ahmed (2018).

5.   Conclusion and Recommendations

The study has as objectives to assess the effect of adopting mobile banking, ATM banking and online banking services on the financial performance of some selected category II Microfinance institutions in Douala. Use was made of secondary data collected from documentary source of the institutions for the period of fourteen years. The panel data were appropriately specified using the random effect model. Results of the study permit us to conclude that mobile banking has a positive and highly significant effect on the financial performance of category II MFIs in Douala. The effect of ATM banking on financial performance of category II MFIs was also positive and highly significant. The effect of online banking on the financial performance of MFIs was as well positive but not very significant.

The policy implications of these results are that, mobile banking services have to be effectively implemented as one of the strategies to improve on the financial performance of category II MFIs especially in large cities like Douala. Again, widespread in the use of ATM banking has to be sensitized as a strategy to beef up the financial performance of category II MFIs as the adoption of such service reduces transaction costs, quicken banking services and renders the institution more competitive. Finally, online banking has to be encouraged even

though with much cautions to avoid scam and other cybercrime on the services as online banking has reported positive but insignificant outcome.

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Appendices

Appendix 1: Results of Fixed Effect Model

```
Fixed-effects (within) regression          Number of obs     =        125
Group variable: identity                   Number of groups  =          9

R-sq:                                      Obs per group:
    within  = 0.6291                                         min =         13
    between = 0.0326                                         avg =       13.9
    overall = 0.2849                                         max =         14

                                           F(3,113)          =      63.89
corr(u_i, Xb)  = -0.0251                    Prob > F          =     0.0000

------------------------------------------------------------------------------
     profitroe |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
mobilemoneybanking |   .6962393    .079155     8.80   0.000     .5394191    .8530596
    atmbanking |   .4339478   .1002267     4.33   0.000     .2353806     .632515
  onlinebanking |   .0885753   .0962408     0.92   0.359    -.1020952    .2792457
         _cons |   1.457948   .0677594    21.52   0.000     1.323705    1.592192
---------------+--------------------------------------------------------------
       sigma_u |  .63954544
       sigma_e |  .33554029
           rho |  .78415248   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(8, 113) = 35.49                Prob > F = 0.0000
```

Appendix 2: Results of random effect model

```
Random-effects GLS regression             Number of obs     =        125
Group variable: identity                   Number of groups  =          9

R-sq:                                      Obs per group:
    within  = 0.6283                                         min =         13
    between = 0.0620                                         avg =       13.9
    overall = 0.3039                                         max =         14

                                           Wald chi2(3)      =     183.80
corr(u_i, X)   = 0 (assumed)               Prob > chi2       =     0.0000

------------------------------------------------------------------------------
     profitroe |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
mobilemoneybanking |   .6761628   .0803808     8.41   0.000     .5186192    .8337063
    atmbanking |   .4366427   .1014866     4.30   0.000     .2377327    .6355528
  onlinebanking |   .1353519   .0969727     1.40   0.163     -.054711    .3254149
         _cons |   1.441824   .1767766     8.16   0.000     1.095348    1.788299
---------------+--------------------------------------------------------------
       sigma_u |  .47754903
       sigma_e |  .33554029
           rho |  .66948342   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Appendix 3: Results of Hausman for Random Model Effect against Fixed Effect Model

. hausman fe re

```
          ---- Coefficients ----
        |     (b)          (B)          (b-B)     sqrt(diag(V_b-V_B))
        |     fe           re        Difference          S.E.
--------+------------------------------------------------------------
mobilemone~g |  .2531864     .3190979     -.0659114       .1246129
  atmbanking |  .4521383     .494546      -.0424077       .103754
onlinebank~g |  .8624624     .8450207      .0174417       .0625082
--------+------------------------------------------------------------
```

```
                    b = consistent under Ho and Ha; obtained from xtreg
             B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

              chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                     =          1.06
             Prob>chi2 =        0.7875
```

Appendix 3: Results of Common Effect Model

```
Random-effects GLS regression              Number of obs     =       125
Group variable: identity                   Number of groups  =         9

R-sq:                                      Obs per group:
    within  = 0.6283                                         min =       13
    between = 0.0620                                         avg =     13.9
    overall = 0.3039                                         max =       14

                                           Wald chi2(3)      =    183.80
corr(u_i, X)   = 0 (assumed)               Prob > chi2       =    0.0000
```

```
---------------+------------------------------------------------------------------
     profitroe |   Coef.     Std. Err.      z     P>|z|     [95% Conf. Interval]
---------------+------------------------------------------------------------------
mobilemoneybanking | .6761628   .0803808    8.41   0.000    .5186192    .8337063
    atmbanking |  .4366427    .1014866    4.30   0.000    .2377327    .6355528
 onlinebanking |  .1353519    .0969727    1.40   0.163   -.054711    .3254149
         _cons |  1.441824    .1767766    8.16   0.000    1.095348    1.788299
---------------+------------------------------------------------------------------
       sigma_u |  .47754903
       sigma_e |  .33554029
           rho |  .66948342   (fraction of variance due to u_i)
---------------------------------------------------------------------------------
```

Appendix 4: Results of Breusch Pagan LM for Random Effect Model against Common Effect Model

```
Breusch and Pagan Lagrangian multiplier test for random effects

    profitroe[identity,t] = Xb + u[identity] + e[identity,t]

    Estimated results:
                    |      Var        sd = sqrt(Var)
            --------+-----------------------------------
          profitroe |   .6478619        .8048987
                  e |   .1125873        .3355403
                  u |   .2280531        .477549

    Test:   Var(u) = 0
                         chibar2(01) =    215.33
                   Prob > chibar2 =     0.0000
```